

Chaetodipus spinatus. By James Alden Lackey

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Chaetodipus spinatus (Merriam, 1889)

Spiny Pocket Mouse

Perognathus spinatus Merriam, 1889:21. Type locality "Lower Colorado River, [in San Bernardino County] California, 25 miles below [T]he Needles."

Perognathus bryanti Merriam, 1894:458. Type locality "San Jose Island, Lower [Baja] California."

Perognathus margaritae Merriam, 1894:459. Type locality "Santa Margarita Island, Lower [Baja] California [Mexico]."

Perognathus evermanni Nelson and Goldman, 1929:111. Type locality "Mejia Island (near north end of Angel de la Guardia Island), Lower [Baja] California, Mexico."

Chaetodipus spinatus: Hafner and Hafner, 1983:24. Elevation of subgenus to generic status.

CONTEXT AND CONTENT. Order Rodentia, Family Heteromyidae, Subfamily Perognathinae. The genus *Chaetodipus* contains 14 species. Eighteen subspecies of *C. spinatus* are recognized (Hall, 1981):

- C. s. broccus* (Huey, 1960:410). Type locality "San Ignacio, lat. 27°17'N., [long. 112°55'W; Bond, 1969] Baja California, Mexico."
- C. s. bryanti* (Merriam, 1894:458), see above. Benson (1930) referred *C. bryanti* to *C. spinatus*.
- C. s. evermanni* (Nelson and Goldman, 1929:111), see above. Burt (1932) referred *C. evermanni* to *C. spinatus*.
- C. s. guardiaae* (Burt, 1932:165). Type locality "Puerto Refugio, north end of Angel de la Guardia Island (altitude 30 feet), Gulf of California, Lower [Baja] California, Mexico."
- C. s. lambi* (Benson, 1930:452). Type locality "San Gabriel, Espiritu Santo Island, Lower [Baja] California, Mexico."
- C. s. latijugularis* (Burt, 1932:168). Type locality "San Francisco Island (latitude 24°50'N., longitude 110°34'W.), Gulf of California, Lower [Baja] California, Mexico."
- C. s. lorenzi* (Banks, 1967a:101). Type locality "South San Lorenzo Island (28°36'N lat., 112°51'W long.), Gulf of California, Baja California, Mexico."
- C. s. magdalenae* (Osgood, 1907:21). Type locality "Magdalena Island, Lower [Baja] California, Mexico."
- C. s. marcosensis* (Burt, 1932:166). Type locality "San Marcos Island (latitude 27°13'N., longitude 112°05'W.), Gulf of California, Lower [Baja] California, Mexico."
- C. s. margaritae* (Merriam, 1894:459), see above.
- C. s. occultus* (Nelson, 1912:116). Type locality "Carmen Island." Miller and Kellogg (1955:382) added "Gulf of California, Baja California, Mexico." *C. s. occultus* (Nelson, 1912) is a re-naming of *C. s. nelsoni* (Townsend, 1912).
- C. s. oribates* (Huey, 1960:409). Type locality "San Fernando Mission, lat. 30°N., [long. 115°15'W; Bond, 1969] Baja California, Mexico."
- C. s. peninsulanae* (Merriam, 1894:460). Type locality "San Jose del Cabo, Peninsula of Lower [Baja] California [Mexico]."
- C. s. prietae* (Huey, 1930:232). Type locality: "25 miles north of Punta Prieta, Lower [Baja] California, Mexico, lat. 29°24' north, long. 114°24' west."
- C. s. pullus* (Burt, 1932:166). Type locality "Coronados Island (latitude 26°06'N., longitude 111°18'W.), Gulf of California, Lower [Baja] California, Mexico."
- C. s. rufescens* (Huey, 1930:231). Type locality "mouth of Palm Canyon, Borego [Borrego] Valley, San Diego County, California."
- C. s. seorsus* (Burt, 1932:167). Type locality "Danzante Island (latitude 25°47'N., longitude 111°11'W.), Gulf of California, Lower [Baja] California, Mexico."
- C. s. spinatus* (Merriam, 1889:21), see above.

GENERAL CHARACTERS. The length of the hind foot is 27% of length of head and body, and the length of the tail is 126% of length of head and body (Hatt, 1932). The pelage of *C. spinatus* is hispid, with large and prominent spines on the rump, scattered on the flanks and sides, and often extending to the shoulders (Fig. 1). Upper parts are drab brown, with the hairs plumbeous basally, pale tan subterminally, and black-tipped. The sides and the orbital region are slightly paler than the back, the lateral line is faint or absent, and the underparts are buffy white. The ears are small and orbicular, dusky, and the subauricular spot is small. The tail is moderately long; hair is brown above, whitish below, and crested. The spines are white with dusky tips, except on the sides where the tips are white (Osgood, 1900). Guard hairs are characterized by a flattened, imbricate scale pattern, and by a dorsal trough that varies among the subspecies in depth and width. *C. spinatus* has the longest and widest guard hairs of any of the eight species of *Chaetodipus* examined; the length (in mm) ranged from 9.7 to 10.0, and the width from 0.12 to 0.14. The base of the hair flares to a broad shaft with an abrupt tip. The cells in the medulla are arranged in a branching pattern as in *C. californicus* and *C. hispidus*, or as distinct cells as in *C. baileyi* (Homan and Genoways, 1978).

Means of external measurements (in mm) of a sample of 20 males and 20 females from throughout the range of the species, respectively, are as follows: total length, 199, 198; length of body, 85, 82.6; length of tail, 114, 115; length of hind foot, 24, 24; length of ear, 10, 10. Cranial measurements (in mm) from the same sample are as follows: basal length of cranium, 16.1, 15.6; greatest length of cranium, 26.3, 25.5; maxillary arch spread, 11.9, 11.7; interorbital width, 6.6, 6.5; nasal length, 10.4, 10.0; intermaxillary width, 4.4, 4.4; alveolar length, 3.8, 3.7; lacrimal length, 1.7, 1.7; maxillary arch width, 1.4, 1.3; basioccipital length, 4.0, 3.8; greatest depth of cranium, 8.4, 8.3; greatest width of cranium, 13.3, 13.1; zygomatic width, 12.9, 12.7; nasal width, 2.8, 2.6 (Fig. 2). Males are significantly larger in basal length of cranium, greatest length of cranium, basioccipital length, and nasal width (Best, in press). The holotype of *C. s. lorenzi*, a male, weighed 13.4 g (Banks, 1967a), and the weights of three females of *C. s. peninsulanae* were 16.4, 16.8, and 17.3 (Banks, 1967b).

DIAGNOSIS. The presence of pronounced rump spines distinguishes *C. spinatus* from pocket mice in the genus *Perognathus* and from *C. formosus*, *C. hispidus*, *C. baileyi*, *C. penicillatus*, *C. pernix*, *C. artus*, *C. lineatus*, and *C. arenarius*. *C. spinatus* differs from *C. dalquesti* in possessing pronounced bristles, often on the flank in addition to the rump, and markedly hispid pelage. From *C. nelsoni*, *C. intermedius*, *C. anthonyi*, *C. fallax*, *C. californicus*, and *C. goldmani*, *C. spinatus* is distinguished by its lack of a well-marked lateral line (Hall, 1981).



FIG. 1. Photograph of *Chaetodipus spinatus bryanti* from San José Island, Baja California, Mexico. Photograph by T. L. Best.

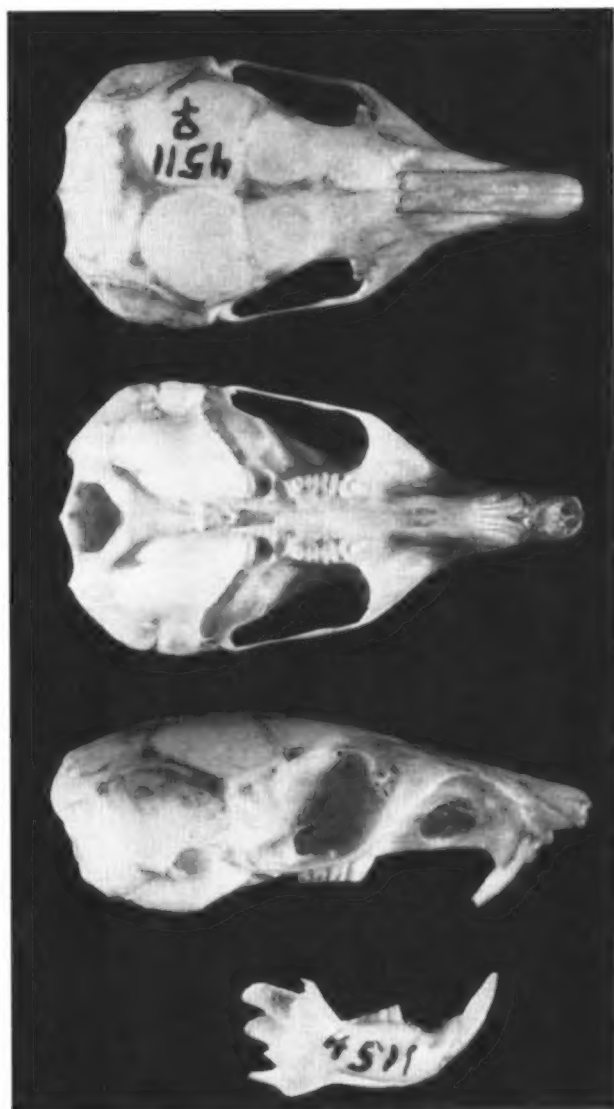


FIG. 2. Dorsal, ventral, and lateral views of cranium, and lateral and dorsal views of mandible of an adult female *Chaetodipus spinatus spinatus* (San Diego Natural History Museum 4511) from 3 miles north of Bard, Imperial Co., California. Greatest length of skull is 24.8 mm. Photograph by J. Ford.

DISTRIBUTION. The geographic range of *C. spinatus* in the United States encompasses a narrow strip between the southern tip of Nevada and the United States-Mexico boundary, adjacent to and west of the Colorado River, and in southcentral California, from Palm Springs, Riverside County, to the United States-Mexico boundary. In Baja California, Mexico, the range includes the southern one-third of the peninsula, and several islands off the southwestern coast; the eastern two-thirds of the remainder of the peninsula northward to the United States-Mexico boundary; and many islands in the Gulf of California (Hall, 1981). Roth (1984) stated that this species was absent from the Magdalena Plain. The existence of the subspecies *C. s. magdalenae* and *C. s. margaritae* on Pacific Islands adjacent to the area creates a biogeographic question if the species is in fact absent from a large area of the adjacent mainland. The altitudinal range of *C. spinatus* in the United States extends upward to 900 m in the Turtle Mountains in southeastern California (Grinnell, 1933), and to approximately 1,500 m in the Sierra Laguna mountain range in the Cape region of southern Baja California (Banks, 1967b). No fossils are known.

FORM AND FUNCTION. Large caudal sebaceous glands were noted in one male *C. spinatus*. These ventrally located glands are found 25–33% of the distance from the base of the tail to the tip (Quay, 1965). The baculum of *C. spinatus* has an enlarged basal

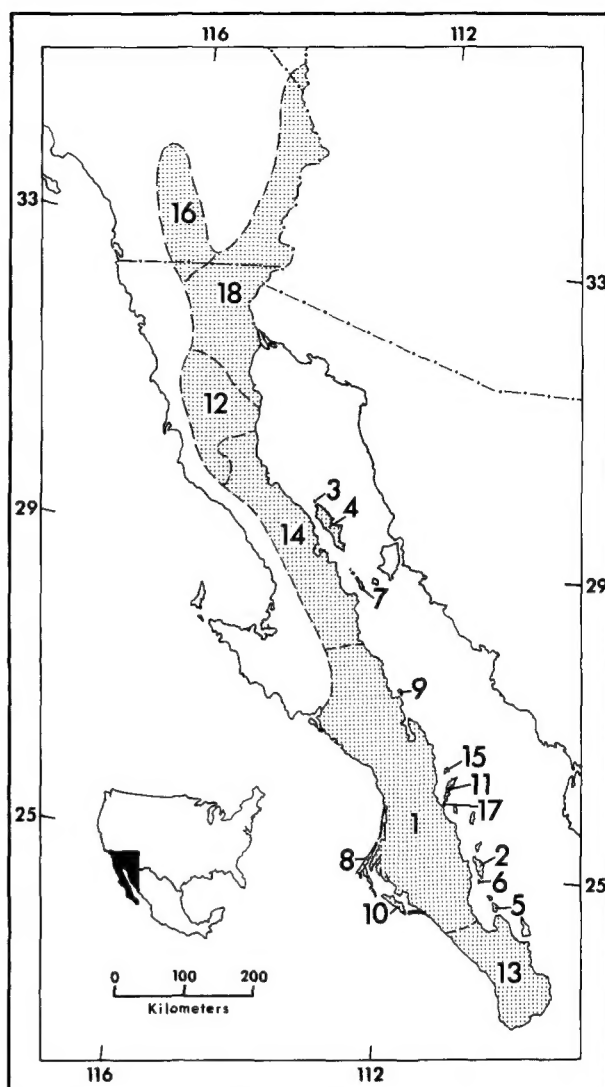


FIG. 3. Distribution of *Chaetodipus spinatus* in California and Baja California (Hall, 1981): 1, *C. a. broccus*; 2, *C. a. bryanti*; 3, *C. a. evermanni*; 4, *C. a. guardiaie*; 5, *C. a. lambi*; 6, *C. a. latijugularis*; 7, *C. a. lorenzi*; 8, *C. a. magdalenae*; 9, *C. a. marcosensis*; 10, *C. a. margaritae*; 11, *C. a. occultus*; 12, *C. a. oribates*; 13, *C. a. peninsulae*; 14, *C. a. prietae*; 15, *C. a. pullus*; 16, *C. a. rufescens*; 17, *C. a. seorsus*; 18, *C. a. spinatus*. Map prepared by M. C. Blake.

portion, usually slightly compressed laterally, and a gradually tapering shaft. Distal to the base, the shaft curves gradually, first ventrally, then dorsally. The tip of the shaft then curves ventrally, attaining an angle of approximately 90° to the main axis of the baculum (Burt, 1936). Range of measurements (in mm; means in parentheses) for 51 specimens from Baja California, are: length of baculum, 9.3–13.0 (10.9); height of base, 0.4–0.9 (0.68; Burt, 1960). The glans penis of *C. spinatus* resembles that of other *Chaetodipus* in having a slender, elongated shape, and in lacking urethral lappets. The bacular projection and the main body of the glans has a covering of small spines in a diamond-shaped arrangement. Each spine consists of a flat structure having five to seven projections directed posteriorly (Kelly, 1969).

The middle ears of pocket mice (*Perognathus* and *Chaetodipus*) have a theoretical transmission of incident-acoustical energy of 94–100%. The middle-ear volume, and dimensions of the malleus, incus, and stapes of *C. spinatus* were the least of the eight species of *Chaetodipus* examined. Only two heteromyids, both species of spiny pocket mice (*Liomys*), had smaller relative middle-ear volumes than *C. spinatus* (Webster and Webster, 1975). The cochlea of pocket mice and of *Liomys* are broad and squat, have a sharply

tapering apex, and have three turns, whereas cochlea of kangaroo rat (*Dipodomys*) and kangaroo mice (*Microdipodops*) exhibit a constriction between the basal and upper turns, the apex is quite blunt, and there are 3.5 turns. These differences between the two groups are not correlated with body size (Webster and Webster, 1977).

Grinnell (1914) reported embryo counts of four in specimens from along the lower Colorado River in April. Nothing else is known about the ontogeny and reproduction of *C. spinatus*.

ECOLOGY. Habitats of *C. spinatus* throughout its geographic range are arid and usually rocky and sloping. In southern California, the habitat of *C. s. spinatus* is characterized as lower Sonoran, hills and rough-surfaced mesas, and desert washes among boulders and stumps; vegetation is sparsely distributed xerophilous shrubs (Grinnell, 1913, 1914, 1933). The habitats of *C. s. rufescens* are desert slopes of the coast range (Huey, 1930). In Baja California, habitats of various subspecies are *C. s. oribates*, rocky terrain (Huey, 1960); *C. s. prietae*, rocky parts of the peninsula from Catavina southward to the vicinity of Santa Gertrudis Mission and Barril on the Gulf of California (Huey, 1964); *C. s. broccus*, lava-covered slopes of the Sierra de la Giganta (Huey, 1960); *C. s. peninsulae*, cactus near the juncture of the meadow and forest (Banks, 1967b); *C. s. seorsus*, a small beach described as quite rough on the island of Danzante (Burt, 1932). There is no published information on the habitats of the 11 other subspecies, most of which are found only on islands.

The habitat of *C. spinatus* resembles that of *C. fallax* although the latter species displays variation in this respect. Near Palm Springs in southern California, the habitat of *C. fallax pallidus* was characterized as rocky slopes and rock outcrops in the agave-ocotillo belt, but only in areas having coarse sand or pebbly soil (Ryan, 1968). *C. spinatus*, occurring in the same habitats at Palm Springs as *C. fallax*, was represented by only two individuals, whereas *C. fallax* was abundant. The possibility of competition between the two species has been noted (Ryan, 1968). In Baja California, the geographic distributions of the two species overlap only slightly (Hall, 1981). The habitat of *C. intermedius*, occurring to the east of the Colorado River, is similar to that of *C. spinatus* (Grinnell, 1914). The distributions of the two species do not overlap, apparently because of the barrier created by the river itself, or the lack of suitable habitat in the vicinity of the river, or both; both species inhabit upland regions usually well away from the river (Goldman, 1937; Grinnell, 1914).

In California, other species of rodents found in the same habitat as *C. spinatus* include the white-tailed antelope squirrel (*Ammospermophilus leucurus*), canyon mouse (*Peromyscus crinitus*); deer mouse (*P. maniculatus*), desert woodrat (*Neotoma lepida*), long-tailed pocket mouse (*C. formosus*), San Diego pocket mouse (*C. fallax*), and Bailey's pocket mouse (*C. baileyi*). The geographic distributions of *C. fallax*, *C. baileyi*, and *P. crinitus*, however, scarcely overlap that of *C. spinatus*. In other instances, habitats are not similar, for example, the habitat of *C. formosus* sometimes includes level, gravelly, or sandy ground (Grinnell, 1914, 1933; Hall, 1981; Ryan, 1968). In Baja California, less is known about the ecology of rodents. In the region of San Augustin, located on the Gulf of California side of northern Baja California, *C. spinatus* is sympatric with four other pocket mice: *C. baileyi*, *C. formosus*, *C. arenarius*, and *Perognathus longimembris* (Huey, 1930; Huey incorrectly included *C. fallax* in this list).

Elliot (1903) noted that a collector reported *C. spinatus* absent from a site in Baja California in March, but present on a subsequent trapping session (date not given). The collector surmised that either the species had migrated to the site in the interim, or had awakened from a state of dormancy. The latter seems more likely, as Vaughan (1954) noted *C. fallax* (a close relative of *C. spinatus*; Patton et al., 1981) in the San Gabriel Mountains of southern California was never trapped on nights when the air temperature was lower than about 4°C, and concluded *C. fallax* remained dormant underground, perhaps for weeks at a time in December and January.

Parasites of *C. spinatus* are the mites *Androlaelaps grandiculatus*, *Steptolaelaps liomydis*, *Ischyropoda spiniger*, *Hirstionyssus hilli*, and *Haemolaelaps* (Bassols de B., 1981; Hoffmann et al., 1972; Keegan, 1951; Ryser, 1964). In a collection of *C. s. spinatus* made in southern Nevada, all specimens were heavily infested with mites on the dorsal aspect of the tail (Ryser, 1964).

GENETICS. Studies of genetic variation at 28 loci in three individuals from two California populations of *C. spinatus* revealed

an average of 1.107 alleles per locus, a mean population polymorphism of 0.071, and an average heterozygosity per individual of 0.045. Phenograms based on three methods of estimating relatedness were consistent in allying *C. spinatus* with *C. fallax*, *C. californicus*, and to a lesser degree, with *C. arenarius* (Patton et al., 1981).

Coat-color polymorphism was noted in *C. s. evermanni* on Isla Mejia, a small island north of Isla Angel de la Guarda, in the Gulf of California (Gill, 1981). Although coat color varies among island populations of this species, this is the only report of coat color polymorphism within a population. The two coat colors are yellowish-agouti and grizzled gray. The 8 gray individuals were adult males, whereas 4 other adult males and all 14 adult females were yellowish. Specimens collected by Burt (1932) were all yellowish-agouti, suggesting the polymorphism either originated since his trapping, or was at such a low frequency that gray individuals were missed by chance (Gill, 1981).

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